

# **Racal**

## **Panoramic adapter**

### **RA-366**

## **Operations & maintenance manual**

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## TECHNICAL SPECIFICATION

Mode of Operation:	(a) Panoramic display of signals in a spectrum up to 1 MHz wide. (b) Spectrum analysis facilities in a band centred on the receiver tuned frequency equal to the receiver bandwidth.
Input Frequencies:	R.F. Mode: 2-3 MHz. I.F. Mode: $1.6 \text{ MHz} \pm f \text{ kHz}$ (where $f$ is half the receiver bandwidth).
Sweep Frequency Range:	R.F. Mode: Adjustable from 100 kHz to 1 MHz with ability to sweep any particular portion of the discrete 1 MHz band. I.F. Mode: Adjustable from 7.5 kHz to a maximum equal to the receiver bandwidth with the ability to sweep any particular portion of the band.
Resolution:	R.F. 1: Capable of resolving two equal amplitude signals spaced by 1.0 kHz (Narrow band). R.F. 2: Capable of resolving two equal amplitude signals spaced by 10 kHz (Wide band). I.F.: Capable of resolving two equal amplitude signals spaced by 1.0 kHz.
Deflection Amplifiers:	Linear with manual gain control facilities.
Sweep Rate:	4 Hz approximately.
Frequency Markers:	R.F. Mode: (a) 100 kHz intervals across spectrum. * (b) Marker indicating receiver frequency. I.F. Mode: Centre frequency marker. * * With Receiver set to CALIBRATE mode.

Sensitivity:	Such as to enable the resolution of a $2\ \mu\text{V}$ signal at the receiver input over the range 3 kHz to 30 MHz with the receiver in the tuned input mode.
Controls:	POWER ON/OFF, R.F. Sweep, R.F. Centre, I.F. Sweep, Tuning Marker ON/OFF, I.F. Centre, Brilliance, Focus, Gain, R.F. - I.F. Mode Selector, Horizontal Position, Vertical Position.
Power Supplies:	Derived from associated receiver (RA.366A) or from an integral power unit (RA.366B). (a) -16 volts regulated 140 mA (nominal). (b) -24 volts unregulated 200 mA (nominal).
Dimensions:	$3\frac{1}{2}$ in. (8.64 cm) high x 19 in. (48.3 cm) wide. (Unit width $8\frac{1}{4}$ in. (20.95 cm) x $16\frac{3}{4}$ in. (42.54 cm) deep).
Weight:	12 lb (5.4 kg) approximately.
Enviromental Conditions:	Operating: $0^{\circ}\text{C}$ to $+55^{\circ}\text{C}$ . Storage: $-40^{\circ}\text{C}$ to $+70^{\circ}\text{C}$ .

# CHAPTER 1

## INTRODUCTION

The Panoramic Adaptor Type RA.366 provides a visual display of signals in any selected frequency band between 980 kHz and 30 MHz. It is designed for use with the Communications Receivers in the RA.1217 series. Signals in the 3 kHz to 980 kHz band may be observed by the addition of the L.F. Adaptor Type RA.337.

The maximum spectrum width that can be viewed is one megahertz and this is selected by the MHz tuning control on the receiver.

When the Panoramic Adaptor is operated in the i.f. mode, spectrum analysis facilities are provided for signals in the i.f. passband of the receiver and are selected by using the kHz tuning control.

In either mode of operation the displayed spectrum can be expanded to permit finite inspection of the selected signal.

Signals appear on the screen of the c.r.t. as inverted "V" deflections; the signal to which the receiver is tuned being seen as a deflection near the centre of the screen. Other signals within the selected spectrum appear to the left or right of centre according to their frequencies, and as the receiver is tuned these deflections will move across the c.r.t. When a deflection approaches the centre of the screen its corresponding signal will be heard through the receiver.

A tuning marker signal is derived from the receiver when the adaptor is used in the r.f. mode and marker pips appear on the screen at 100 kHz intervals when the receiver is set to CAL.

There are two types of adaptor RA.366 and these differ only in the power supply unit which is available for the panoramic adaptor. The units are identified as follows:

RA.366A (Drg. DA.40880/A): less power supply unit- for use with RA.1217 having 10 mW audio output.

RA.366B(Drg. DA.40880/B): with power supply unit - for use with RA.217, RA.1218/RA.1220 and RA.1217 with 1 watt audio output.

The power unit used in the RA.366B is the PU.1153 which is described in the appendix. The connections between this power unit and the RA.366 are shown in Fig. 10

## CHAPTER 2

### INSTALLATION

1. After unpacking the Panoramic Adaptor, inspect the unit carefully for any visible signs of damage. Ensure that the chassis and c.r.t. are completely clear of fluff and shavings.

#### Power Supply

2. (a) Ensure that the receiver power input switch is set correctly to a.c. or d.c. according to the type of power supply in use.  
(b) Ensure that the Panoramic Adaptor BATTERY/LINE switch on the rear panel is correctly set for the power supply in use.

#### Connections to Receiver

3. The following connections should be made between the receiver and the RA. 366.

##### Coaxial Connections

<u>RA. 366</u>	<u>Receiver</u>
2-3 MHz input (J201)	2-3 MHz out
1.6 MHz narrow (J102)	1.6 MHz out
2nd V.F.O. (J202)	2nd V.F.O. out

##### Power Connections

RA. 366A. The power supplies are taken from the associated receiver and the following connections are required:

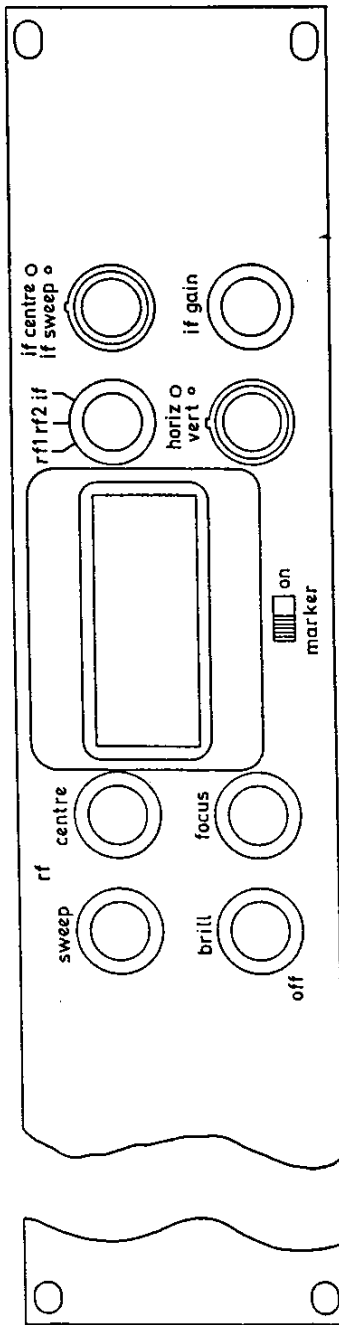
<u>RA. 366</u>	<u>Receiver</u>
-16V regulated	-16V regulated
Earth (Ground)	Earth
-16V unregulated	-20V unregulated

RA. 366B. The power supplies are taken from an integral power unit and the connections should be made as shown in Fig. 10.

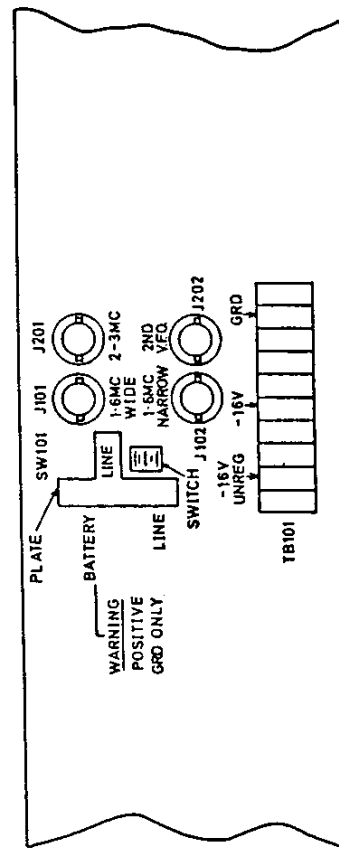
#### CAUTION

OBSERVE POLARITY WHEN MAKING POWER SUPPLY CONNECTIONS.

IF THE -16V REGULATED AND -20V UNREGULATED CONNECTIONS ARE REVERSED THE D.C./D.C. INVERTER IN THE RA. 366 WILL BE PERMANENTLY DAMAGED.



FRONT PANEL



REAR PANEL

FRONT & REAR PANELS: RA.366

FIG.2-1

H 309/2-1

## CHAPTER 3

### SETTING TO WORK

#### Preliminary Settings

NOTE: The following control settings should be made with the power OFF at the receiver and the panoramic adaptor, and with all inter-connections correctly made.

1.
  - (1) Rotate the r.f. sweep control fully clockwise.
  - (2) Rotate the i.f. sweep control fully clockwise.
  - (3) Set the horizontal and vertical position controls to mid-range.
  - (4) Set the r.f. centre and i.f. centre controls to mid-range.
  - (5) Switch the selector to "rf2".
  - (6) Set the marker switch to 'on'.
  - (7) Rotate the i.f. gain control fully clockwise.
  - (8) Turn the brilliance and focus controls fully anticlockwise.

Switch ON the receiver and the panoramic adaptor.

2. With the power switched on:
  - (1) Adjust the brilliance and focus controls for a suitable trace (approx. mid-range).
  - (2) Adjust the vertical control for a trace along the etched line near the bottom of the c.r.t.
  - (3) Adjust the horizontal control until the trace is centred and extends to both edges of the c.r.t.

When the foregoing settings have been made, a negative square wave (marker) should appear on the c.r.t.

NOTE: If the unit is switched OFF and then immediately switched ON, the trace may not reappear. If this occurs, switch the unit off and wait approximately 15 seconds for the power circuits to discharge before switching on. In extreme cases, however, it may be necessary to operate the ON-OFF switch in rapid sequence from ON-to-OFF-to-ON in order to obtain the missing trace.



### R.F. Mode Calibration

3. (1) Make the preliminary settings listed above and adjust the r.f. centre control to centre the tuning marker on the c.r.t.
- (2) Switch the receiver to CAL and set the kHz control to 500 kHz. Eleven marker pips (100 kHz) markers should appear on the trace of the RA. 366.
- (3) Rotate the kHz control on the receiver from 0 kHz to 1000 kHz and ensure that the tuning marker is at the extreme left at 0 kHz, and at the extreme right at 1000 kHz.
- (4) Connect a 1 microvolt, 2.5 MHz signal to the receiver r.f. input and note that a positive 'pip' approximately  $\frac{1}{4}$ " (6 mm) high appears above the marker pulse.
- (5) With the signal centred, rotate the 'rf sweep' control counter-clockwise and observe that the sweep width narrows from 1 MHz to 100 kHz i.e. the signal pip opens up but remains sensibly centred on the c.r.t.
- (6) Switch the selector to 'rfl' and note that a narrower spectrum signal also appears slightly smaller in amplitude. This is caused by the crystal filter which is switched into circuit in this mode of operation.

### I.F. Mode Calibration

4. (1) Switch the selector to "i.f." and note that the marker pulse disappears.
- (2) Turn the "i.f. sweep" control fully clockwise and adjust the "i.f. centre" control to obtain a response in the centre of the trace. Set the receiver i.f. bandwidth to maximum.
- (3) Turn the receiver kHz dial and observe that the two moving pips converge on the fixed one in the centre of the trace.
- (4) Continue turning the kHz control until the largest pip is at the right hand side of the trace. Note this figure in kHz. Turn the kHz control until the same pip is at the left hand side of the trace and note the figure in kHz. Subtract the second reading from the first; the difference is the maximum sweep in the i.f. position of the selector switch.
- (5) Turn the "i.f. sweep" control fully counter-clockwise. The pip should increase in width at the centre. (Slight adjustment of the "i.f. centre" control may be necessary.)

- (6) Rotate the kHz control on the receiver until the pip is at the right hand edge of the trace. Note the figure in kHz. Turn the kHz control until the response is at the left hand edge of the trace. Subtract this figure from the first reading. The difference should be less than 100 kHz and indicates the minimum sweep width in the i.f. position of the selector.

## CHAPTER 4

### OPERATING INSTRUCTIONS

References to the controls are in accordance with the titles shown on the front panel (see Fig. 2.1).

#### Function

- |                    |   |
|--------------------|---|
| r.f. sweep         | This control adjusts the sweep width of the r.f. spectrum. The sweep width can be varied from 1 MHz (fully clockwise) down to 100 kHz.  |
| r.f. centre        | When the selector switch is in the r.f.1 or r.f.2 position this control enables the displayed r.f. spectrum to be shifted horizontally on the c.r.t.  |
| brill (brilliance) | This control is combined with the power ON/OFF switch. Clockwise rotation increases the intensity of the trace.   |
| rf1, rf2, i.f.     | Selector switch:<br><br>rf1 R.F. narrow band position. Provides for the resolution of two r.f. signals separated by 1 kHz or more. When operating in this mode the r.f. sweep width should be reduced to 100 kHz (fully clockwise).<br><br>rf2 R.F. wideband position. Provides for the resolution of two r.f. signals separated by 10 kHz or more. It is used to observe the r.f. spectrum from 1 MHz to 100 kHz by varying the r.f. sweep width to obtain the required spectrum width.<br><br>i.f. Enables various i.f. spectrum widths to be observed depending upon the i.f. bandwidth setting of the receiver. Provides for the resolution of two signals separated by 1 kHz or more. In this position the receiver tuning marker is disconnected. |

i.f. centre)	A dual concentric control:
i.f. sweep)	
	i.f. centre: Larger (outer) knob. Used to adjust the horizontal position of signals when operating in the i.f. mode.
	i.f. sweep: Smaller (inner) knob. Adjusts the i.f. sweep width from approximately 13 kHz (fully clockwise) down to 7.5 kHz when switched to the i.f. mode.
horizontal	Dual concentric control:
vertical	
	horizontal: Outer knob: Shifts the displayed trace left or right on the c.r.t.
	vertical: Inner (smaller) knob: Shifts the displayed trace up or down on the c.r.t.
i.f. gain	Adjust the amplifier gain. Maximum gain is fully clockwise.
marker ON/OFF	In the marker "ON" position the receiver tuning marker is available when switched to the rf1 or rf2 modes of the RA.366.

### Display of Individual Signals

1. The i.f. position of the selector switch enables a discrete portion of the r.f. spectrum to be examined. When this facility is required the following procedure should be adopted without moving the r.f. centre control from its correct setting.
2. With the selector switch in the r.f.2 position, and the "marker" switch ON, tune the receiver exactly to the desired signal in the r.f. spectrum. (Use the receive tuning marker that is displayed on the c.r.t.).
3. Set the RA.366 selector to the i.f. position. The desired signal pip will appear in the centre of the c.r.t. without the tuning marker. (A slight adjustment of the receiver kHz control may be necessary to obtain maximum amplitude of the displayed signal).
4. An analysis of the signal is then possible by adjusting the i.f. sweep control.
5. The i.f. spectrum display is limited by the i.f. bandwidth of the associated receiver.

## CHAPTER 5

### BRIEF TECHNICAL DESCRIPTION

1. The block diagram shown in Fig. 5.1 should be used in conjunction with the information in this chapter.

#### R.F. Amplifier and 1st R.F. Mixer

2. The output from the receiver (2-3 MHz input) is applied to the 2-3 MHz amplifier in the panoramic adaptor RA.366. The amplifier output is fed through a 2-3 MHz bandpass filter and is combined in the 1st r.f. mixer with 23-24 MHz from the sweep oscillator.
3. The resultant frequency difference of 21 MHz is then applied to the 2nd r.f. mixer.

#### 2nd R.F. Mixer and 19.4 MHz Crystal Oscillator

4. The 21 MHz signal is combined with 19.4 MHz from the crystal oscillator in the 2nd r.f. mixer. The 1.6 MHz i.f. output from the 2nd r.f. mixer is passed through a low-pass filter to the i.f. module via the r.f. position of the r.f./i.f. selector switch.

#### I.F. Module, 1.6 MHz Amplifier, and 1st I.F. Mixer

5. The 1.6 MHz signal from the receiver is selected by the selector switch (r.f. position) on the front panel of the RA.366. In this mode, the 1.6 MHz signal is amplified and taken via a bandpass filter to the 1st i.f. mixer of the adaptor.
6. In the "r.f." position of the selector, the mixer combines 1.145 MHz from the i.f. crystal oscillator with the 1.6 MHz signal to produce 455 kHz.
7. In the "i.f." position, the r.f. section is switched out of circuit and the 1st i.f. mixer then combines the 1.6 MHz signal from the receiver with the sweep oscillator output ( $1.145 \text{ MHz} \pm 40 \text{ kHz}$ ) to produce 455 kHz. The 455 kHz signal is amplified and fed through the crystal filter.
8. The amplified 455 kHz signal is taken via the diode detector to a vertical amplifier and the Y deflection plates on the c.r.t.

### Sawtooth Generators

9. The horizontal sawtooth generator receives a synchronising pulse from the i.f. sawtooth generator and produces a time base deflection voltage which is amplified by the horizontal deflection amplifier. The pulse is then fed to the horizontal deflection plates on the c.r.t.
10. The horizontal sawtooth generator also supplies a synchronizing pulse to the r.f. sawtooth generator to ensure that all three sawtooth generators are in synchronization.

### Sweep Oscillator (23-24 MHz)

11. The r.f. sawtooth generator provides a sawtooth voltage to the r.f. sweep oscillator at a sweep rate of 4 hertz. This sweep rate is set by an internal adjustment in the r.f. sawtooth generator. The oscillator sweeps from 23-24 MHz and is fed to the 1st r.f. mixer and the 1st marker mixer.

### Receiver Marker

12. An output of 3.6-4.6 MHz is taken from the 2nd V.F.O. of the receiver and is fed, via a low pass filter, to the 1st marker mixer of the RA.366. A negative blanking pulse is also fed to the 1st marker mixer from a multivibrator which is triggered by the horizontal sawtooth generator. The mixer combines the 3.6-4.6 MHz with the 23-24 MHz output from the sweep oscillator to produce 19.4 MHz.

### 2nd Marker Mixer and Marker Generator

13. The 19.4 MHz output from the 1st marker mixer is combined with 19.4 MHz from the r.f. crystal oscillator to produce a zero beat  $\pm 1$  kHz output. This signal is amplified and fed to a multivibrator which produces a wide positive going square wave. The wide pulse width is necessary to prevent double pulsing of the marker generator by the audio signal on either side of zero beat.
14. The multivibrator square wave output is integrated to obtain a positive spike which is used to trigger a third multivibrator. This multivibrator produces a positive square wave marker which is taken to the i.f. and detector module.
15. The marker pulse and the detected signal are taken simultaneously to the Y-deflection plates of the c.r.t.

16. As the receiver is tuned (kHz), the receiver's 2nd V.F.O. frequency (3.6-4.6 MHz) varies the position of the marker pulse relative to the 23-24 MHz horizontal time base.

Power Unit (Internal d.c./d.c.)

17. A d.c./d.c. inverter produces the e.h.t. voltages to operate the c.r.t.



**FIG. 5-1**



## CHAPTER 6

### DETAILED CIRCUIT DESCRIPTION

1. In order to assist in understanding the circuitry of the panoramic adaptor it is useful to regard it as consisting of three sub-units viz: the r.f. signal channel; the i.f. signal channel, and the calibration marker circuits. (The internal d.c./d.c. inverter is additional).

#### Interconnections and Input Circuits (Figs. 1a and 1b)

2. The signal connections from the receiver to the panoramic adaptor are made via coaxial cables. Although the cable lengths are not critical, any excessive extensions will attenuate the spectrum signal input and can de-tune the 4.6 MHz low-pass filter.

#### R.F. Amplifier and 1st R.F. Mixer (Fig. 3)

3. The r.f. input spectrum (2-3 MHz) is taken to the base of Q1 via R38, L1, and C7. The amplified signal is filtered by the bandpass components A1 to A7 and is applied to the base of the mixer Q4.
4. A 23-24 MHz signal is derived from the sweep oscillator (Q3) and is mixed in Q4 to produce 21 MHz.
5. A second 23-24 MHz output is taken from the sweep oscillator circuit to the buffer amplifier Q8 in the Marker circuit (Fig. 4).

#### 2nd R.F. Mixer (Fig. 3)

6. The first and second r.f. mixers are coupled by a filter which is tuned to 21 MHz by the preset capacitors C24/5. Q5 also accepts a signal from the 19.4 MHz oscillator and the 1.6 MHz output is fed via a 1.6 MHz low-pass filter (L3, C36) to the i.f. module.
7. The 19.4 MHz crystal controlled oscillator also supplies a second output which is taken to the emitter of the second marker mixer Q4 (Fig. 4).

#### I.F. and Detector Module (Fig. 6)

8. Two i.f. inputs are available; one from the swept r.f. stages, and the other directly from the receiver. Selection is effected by the mode selector switch (r.f./i.f.) which functions via relay K1; the selected input being routed to Q1 via the front panel i.f. gain control.

9. The amplified i.f. signal is filtered by the bandpass filter formed by tuned coils L1, L2, assemblies A1/2 and capacitors C6, C8.

#### 1st I.F. Mixer and Filters (Fig. 6)

10. Capacitor C9 couples the 1.6 MHz signal from the bandpass filter to the base of mixer Q2. 1.145 MHz is fed to the emitter from the crystal oscillator when the selector switch is in the r.f. position, or from the sweep oscillator when in the i.f. position. The resultant i.f. difference of 455 kHz is then fed to the tuned primary winding of T1.
11. Capacitor C13 couples the 455 kHz from the transformer secondary winding to the base of i.f. amplifier Q3. R22 is used to set the gain of the 455 kHz amplifier.
12. The 455 kHz signal is passed from Q3 through relay K2 to either the LC filter or the crystal filter FL1 depending on the position of the selector switch.
13. When the selector switch is in the r.f.1 or i.f. position the crystal filter is in the circuit. Since the crystal filter bandwidth is only 500 Hz, the r.f.1 position is useful only when the r.f. sweep width is reduced to 100 kHz.
14. With the selector switch in the r.f.2 position, the LC filter is in circuit. Since the bandwidth of the LC filter is approximately 10 kHz this filter may be used for any setting of the r.f. sweep width control.
15. After filtering, the 455 kHz signal is amplified by Q4 and fed through tuned transformers T2 and T3 to the diode detection stage and voltage doubler consisting of CR1, CR2, C27 and C28.

#### Diode Detector and Vertical Amplifier (Fig. 6)

16. All signals appearing at the input of the detector circuit (C27) are both positive and negative. It is not necessary to display the entire signal since one-half mirrors the other, so the signals are detected or rectified and coupled producing a positive going spectrum which is then fed to the vertical amplifier.
17. Potentiometer R35 is used to adjust the gain of the detected signal while potentiometer R39 is preset to adjust the emitter bias, preventing saturation or cut-off of Q5.

18. The detector circuit provides a linear output to the vertical deflection amplifier which feeds the vertical deflection plates on the display tube. Positive square wave pulses from the marker module are also fed to the vertical deflection circuit via terminal E14 through resistor R37 and out via terminal E13.

#### I.F. SWEEP (Fig. 7)

##### I.F. Sawtooth Generator and 1.145 MHz Oscillator

19. Unijunction transistor Q1 and emitter follower Q2 form a relaxation oscillator producing a non-linear sawtooth voltage. The output of the oscillator is fed via R9 through the i.f. sweep width control and relay K1 (when in the i.f. position of the selector switch) to the varicap CR1 where it is used to vary the voltage and, therefore, the capacitance thus varying the frequency of the 1.145 MHz oscillator.
20. In the r.f. position the sawtooth voltage is eliminated and the oscillator is then crystal controlled.
21. This sawtooth voltage is also tapped from the emitter of Q2, integrated and fed to the horizontal sawtooth generator for use as a synchronizing pulse.
22. The 1.145 MHz oscillator signal is fed via terminal E12 to the 1st i.f. mixer.
23. Potentiometer R5 is preset to adjust the sweep rate (approximately 250m sec) of the sawtooth generator.
24. R6 is used to adjust the linearity of the sawtooth voltage and thus compensate for the non-linearity in varicap CR1.
25. The d.c. balance potentiometer R10 is adjusted so that a change in the amplitude of the sawtooth voltage will not cause a shift in the mean d.c. reference level.
26. Potentiometer R11 is used to pull the frequency of the crystal controlled oscillator.

#### HORIZONTAL AND R.F. TIME BASE (Fig. 8)

##### (Horizontal Sawtooth Generator)

27. The synchronizing pulse from the i.f. sawtooth generator is fed via C1, emitter follower Q1 and C3 to the second base of the unijunction transistor Q2 where it is used to trigger the horizontal sawtooth generator.

28. Potentiometer R7 is preset to adjust the sweep rate by adjustment of the RC time constant.
29. Potentiometer R8 adjusts the linearity of the sawtooth voltage, and potentiometer R13 provides for the d.c. balance adjustment.
30. Potentiometer R12 is used to set the horizontal gain (dispersion) of the trace.
31. From the wiper of potentiometer R12 the horizontal voltage is fed to the horizontal deflection amplifier Q4, and then via terminal E7 to pin 2 (horizontal plate) of the display tube.
32. Potentiometer R15 is used to preset the emitter bias on Q4.
33. The sawtooth voltage produced by Q3 is integrated by C7 and fed to the emitter-follower stage Q5; the trigger pulse output of Q5 being applied via C10 to the unijunction transistor Q6 where it is used to synchronize the r.f. sawtooth generator. It is also fed via terminal E8 to the marker circuit where it is used to trigger the blanking pulse generator.
34. Potentiometer R23 is used to adjust the sweep rate of the r.f. sawtooth generator and potentiometer R24 is used to adjust the linearity of the sawtooth voltage.

#### Marker Circuits (Fig. 4)

35. The 3.6-4.6 MHz 2nd V.F.O. output from the associated receiver is fed via a 4.6 MHz low-pass filter (A1, A2) to the base of the 1st marker mixer Q5.
36. A 10 volt negative blanking pulse is also fed to the base of Q5 which cuts off the transistor during the flyback period of the sweep oscillator. The blanking pulse is generated by multivibrator Q1 and Q2 which is triggered by a pulse from the horizontal sawtooth generator.
37. The sweep oscillator output (23-24 MHz) is injected at the emitter of Q5 from buffer amplifier Q8 and is combined with the 4.6 MHz signal at the base.
38. The 1st marker mixer output is  $19.4 \text{ MHz} \pm$  a discrete band of frequencies. This frequency band is determined by the double tuned circuit T1 and T2, and is fed via the capacitive divider C16 and C17 to the base of the 2nd marker mixer Q4. 19.4 MHz from the crystal oscillator on the swept r.f. board is injected to the emitter of Q4. The output of Q4 is a zero beat  $\pm$  a discrete band of frequencies which is passed through a 1 kHz low-pass filter (R23 and C11) and then via C13 to emitter follower Q6 and amplifier Q7.

39. The output of Q7 triggers the 2nd multivibrator (Q9 and Q10) which has a pulse width of approximately 200 milliseconds and is integrated by C28.
40. The integrated positive pulse is fed via CR3 and triggers the 3rd multivibrator Q11 and Q12. The output of the 3rd multivibrator is the marker pulse seen on the c.r.t. This narrow negative pulse is approximately 5 milliseconds wide. Because of its narrow pulse width, if the zero  $\pm 1$  kHz signal is fed directly to the 3rd multivibrator, both the zero -1 kHz and zero +1 kHz signal would trigger the multivibrator thereby producing an extraneous marker pulse. The 2nd multivibrator prevents double pulsing because its wide pulse width is triggered only by the zero -1 kHz signal and produces only one trigger pulse for each sweep cycle.

#### Power Supplies (Fig. 9)

41. The power required to operate the panoramic adaptor can be derived from the associated receiver. When the receiver is operating on a.c. line voltage there are two negative d.c. voltages fed via interconnecting cables to the RA.366:
- (a) -16V d.c. regulated.
  - (b) -21 to -40V d.c. unregulated (-16V unregulated terminal).
42. For battery operation, only -16V is required with the positive side grounded.
43. During mains operation, the unregulated d.c. voltage (-21 to -40V) from the receiver is fed to a series voltage regulator in the power unit. Potentiometer R2 is used to set the output voltage at -16.0 volts at Test Point 2.
44. When battery operated, the voltage regulator is by-passed and the -16 volts d.c. is fed directly to a d.c./d.c. inverter via terminal E1.
45. The inverter provides three outputs:
- (1) A 1.5 volt r.m.s. output which is fed to the filaments of the c.r.t. (Pins 3 and 8).
  - (2) A -2000V d.c. which is fed through a resistive divider network to ground. Included in this divider are the intensity (Pin 3) and focus controls (Pin 5). It is also fed directly to the grid (Pin 4) of the c.r.t.

- (3) 400 volts d.c. is fed to a 290 volt zener diode regulator chain consisting of VR2, VR3 and VR4. The 290 volt supply is then fed in parallel to the horizontal position control (Pin 1), the vertical position control (Pin 7) and also to the horizontal sweep amplifier. Both the horizontal and vertical control circuits are resistive divider chains. Included in the zener chain is a 70 volt d.c. tap which supplies the vertical amplifier.

46. When the power supplies are taken from an integral power unit, as in the RA. 366B the same voltage levels are applied to the panoramic adaptor and the outputs from the inverter are as described in para. 45.

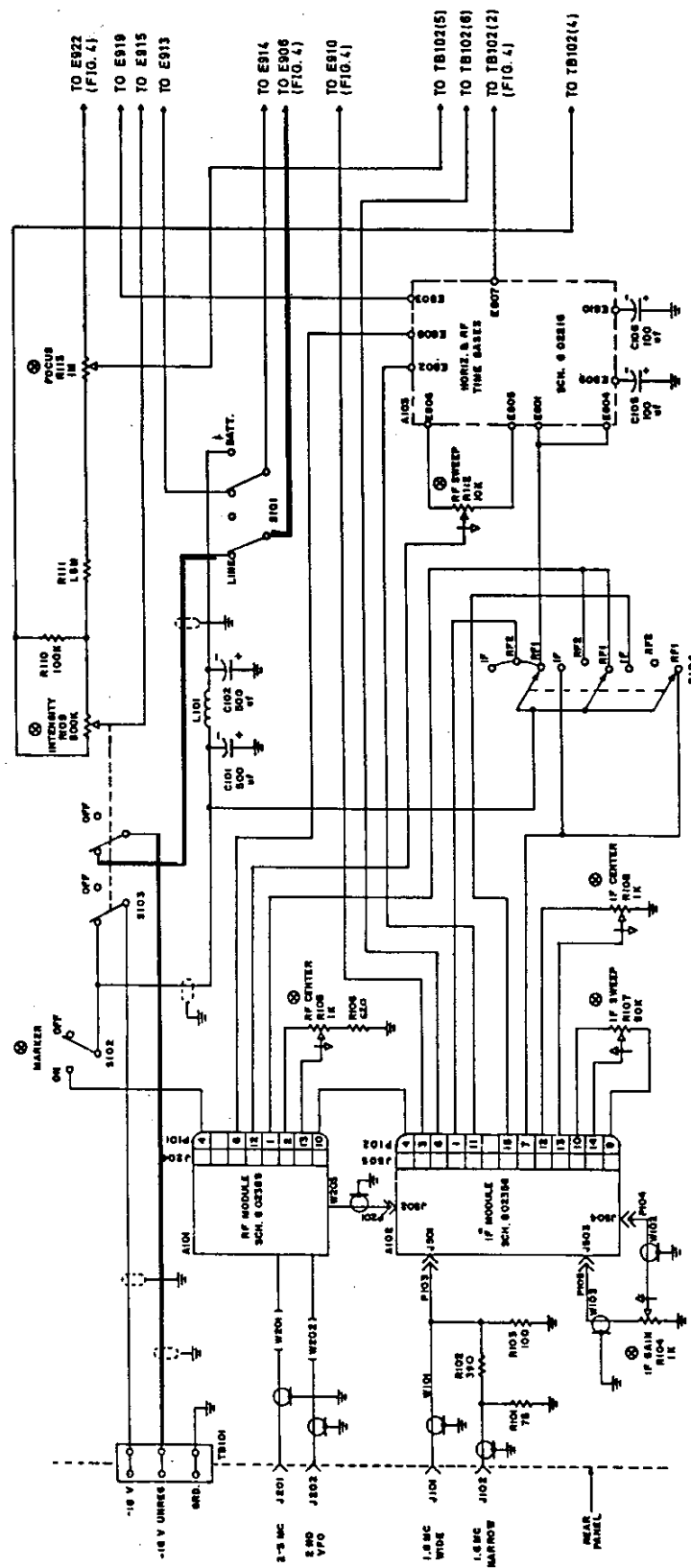
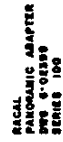


Fig.1 a

Main Chassis: Interconnections (Sheet 1) RA.366

H309/10



Main Chassis: Interconnections (Sheet 2) RA.366



# MAIN CHASSIS

## 100 Series

Cct. Ref.	Description	Value	Tol. %	Rat.	Mfr. Part No.
<u>Resistors</u>					
		Ohms		watts	
R101	Fixed Composition	75	5	1/4	RC07GF150J
R102	Fixed Composition	390	5	1/4	RC07GF391J
R103	Fixed Composition	100	5	1/4	RC07GF101J
R104	Potentiometer	1k (i.f.gain)			RCI B-02337
R105	Potentiometer	1k (r.fcentre)			RCI B-02336
R106	Fixed Composition	620	5	1/4	RC07GF621J
R107	Potentiometer	50k (i.f. sweep)		(dual)	(RCI B-02334)
R108	Potentiometer	1k (i.fcentre)			(RCI B-02334)
R109	Potentiometer	500k (brilliance)			RCI B-02332
R110	Fixed Composition	100k	5	1/4	RC07GF104J
R111	Fixed Composition	1.5M	5	1/4	RC07GF155J
R112	Potentiometer	10k (r.f. sweep)			RCI B-02335
R113	Potentiometer	1M (focus)			RCI B-02333
R114	Fixed Composition	220k	5	1/4	RC07GF224J
R115	Potentiometer	1M (horizontal position)			RCI B-02338
R116	Fixed Composition	47k	5	1/4	RC07GF473J
R117	Potentiometer (dual with R115)	250k (vertical position)			RCI B-02338
<u>Capacitors</u>					
		µF		volts	
C101	Electrolytic	500	-10+75	50	Sprague 39D507G05G14
C102	Electrolytic	500	-10+75	50	Sprague 39D507G05G14
C103	Electrolytic	500	-10+75	50	Sprague 39D507G05G14
C104	Electrolytic	500	-10+75	50	Sprague 39D507G05G14
C105	Electrolytic	100µF	20	25	Sprague TE-1211
C106	Electrolytic	100µF	20		Sprague TE-1211
<u>Inductors</u>					
L101	Filter Choke	150µH		250mA	National R-40-150
<u>Tube &amp; Socket</u>					
V101	Cathode Ray Tube				Sylvania 3BGP7
XV101	Pre-wired Octal Socket				Sylvania 8000-7038

MAIN CHASSIS - 100 Series contd

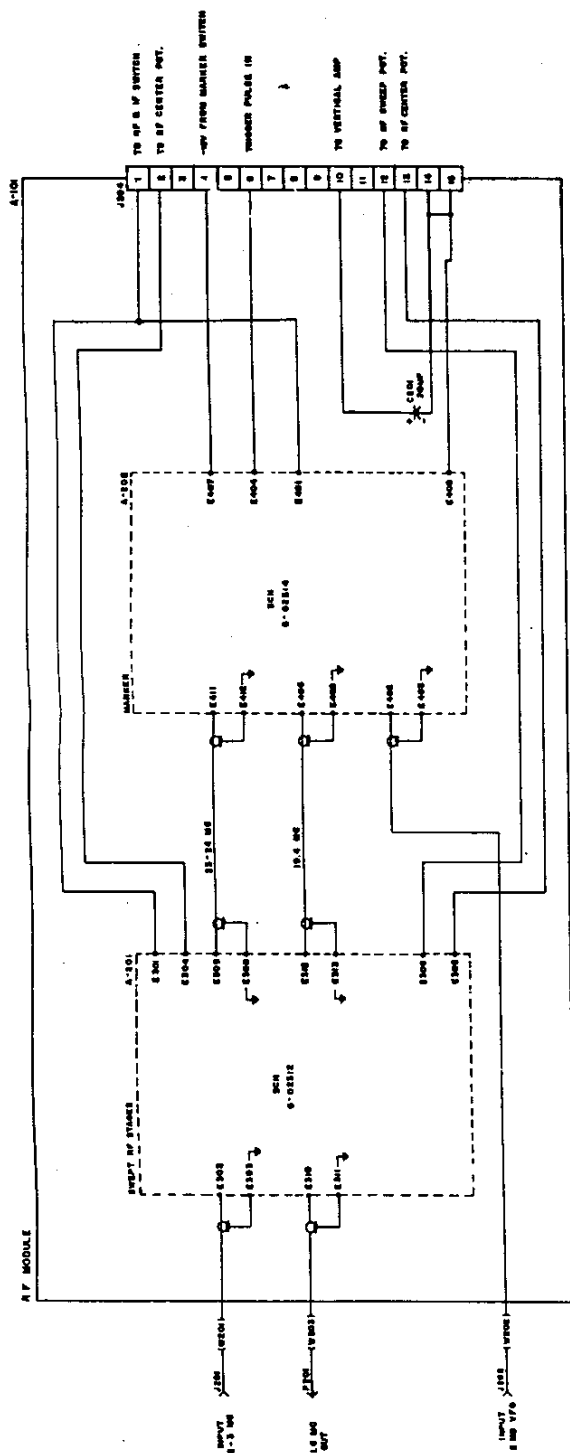
Cct. Ref.	Description	Value	Tol %	Rat.	Mfr. Part No.
<u>Transistor</u>					
Q101	2N3614 - Germanium, PNP				Motorola RCI 30751
<u>Transformer</u>					
A105	Power Transformer (Inverter)				RCI C-02000
<u>Switches</u>					
S101	dpdt Slide Switch Line (Receiver)/Battery				Oak 278
S102	dpdt Slide Switch (Marker On/Off)				Oak 278
S103	Power On/Off, Part of R109				B-02332
S104	Rotary, 3 position (RF/IF Selector)				B-02542-1
<u>Terminal Strips</u>					
TB101	Rear Panel, 3 position				RCI 70320
TB102	10 position				RCI 70300
<u>Connectors</u>					
J101	Coaxial, 1.6 MHz Wideband Input				Micon 1003
J102	Coaxial, 1.6 MHz Narrowband Input				Micon 1003
P101	Plug - 15 contacts				Cannon DAM-15S
P102	Plug - 15 contacts				Cannon DAM-15S
P103	Coaxial Plug				Micon 1002/196
P104	Coaxial Plug				Micon 1002/196
P105	Coaxial Plug				Micon 1002/196

UNLESS OTHERWISE NOTED:

1. NEGATIVE VALUES ARE IN DASH UNIT  
E. 1,000 W. 1,000,000
2. CAPACITY VALUES GREATER THAN ONE ARE IN PICO FARADS, LESS THAN ONE ARE IN MICROFARADS.
3. IMPEDANCE VALUES GREATER THAN ONE ARE IN MICROHMS, LESS THAN ONE ARE IN MILLIHMS.
4. PRESENCE OF ABOVE INDICATES CLOCKWISE ROTATION

⊗ INDICATES COUNTERCLOCKWISE ADJUSTMENT

220000  
 220000  
 220000



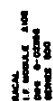
**FIG. 2.**

R.F. Module Interconnections RA.366


**H 309/2**







UNLESS OTHERWISE NOTED:

1. RESISTOR VALUES ARE IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITOR VALUES GREATER THAN 100 PICOFARADS, LEAD TO 10 MICROFARADS.
3. INDUCTANCE VALUES GREATER THAN 100 MICROHENRIES, LEAD TO 1 HENRY.
4.  PRESENCE OF AN ARROW INDICATES A VARIABLE COMPONENT.

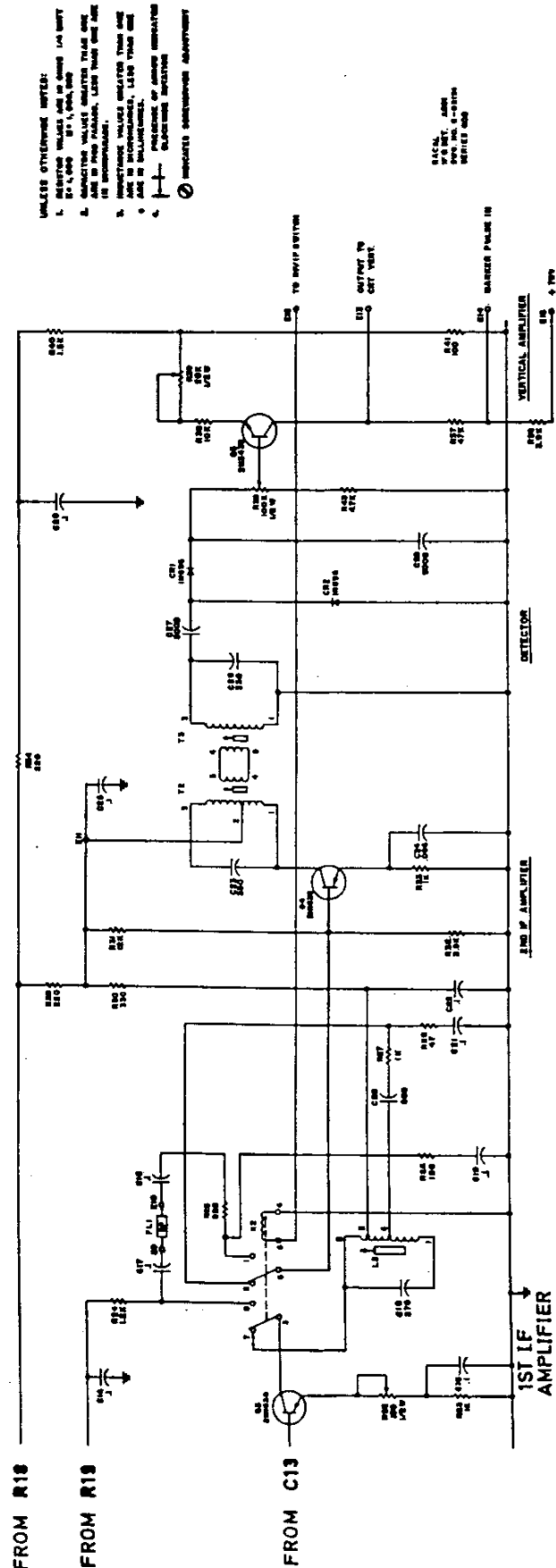
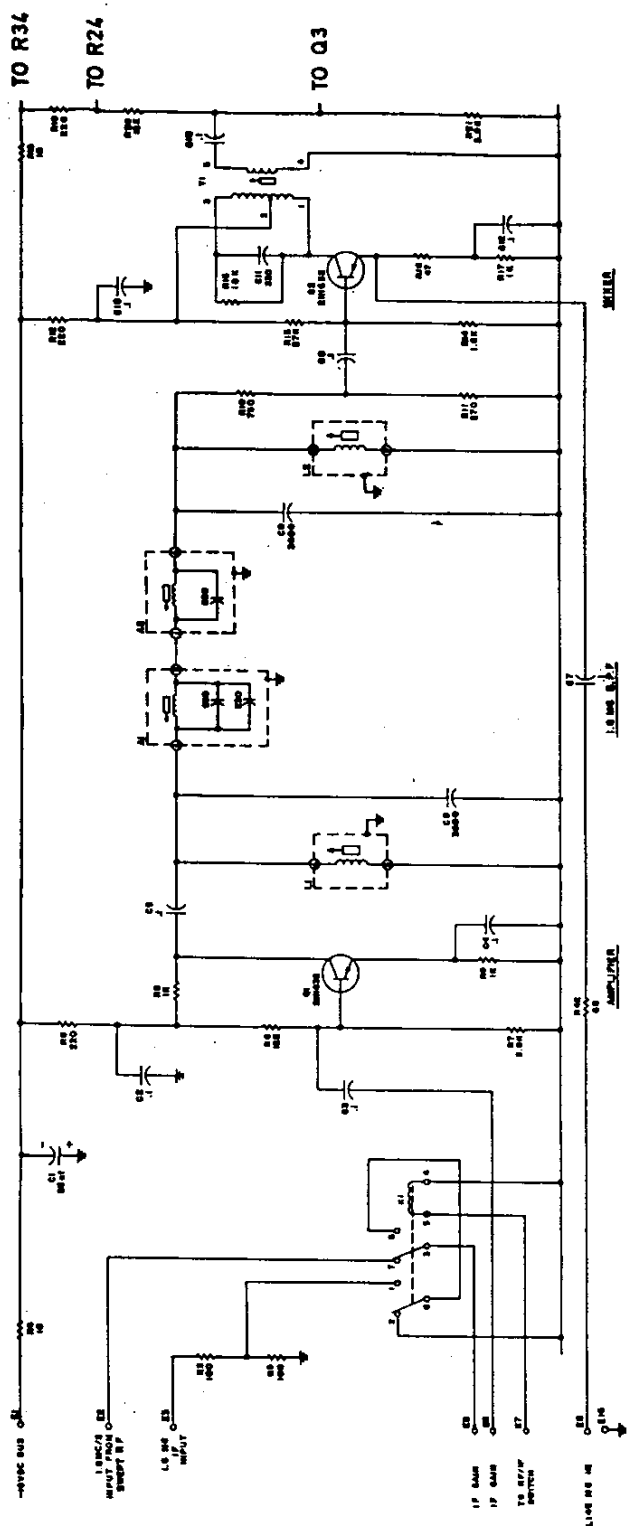
② MONITORING SCHEMATIC

LOCAL  
1.F. MIDDLE AGE  
BORN 6-10-1918  
DIED 1960

I.I.F. Module Interconnections RA.366

Fig. 5

H309/5



19/60EH

**Circuit. 1F Module DA 266**

SECRET

i











UNLESS OTHERWISE NOTED:

1. READING VALUES ARE IN OHMS 1/4 WATT X 4,000  $\pm$  1,000,000.
2. CAPACITOR VALUES INDICATED FEWER THAN ONE ARE IN MICRO FARADS, LESS THAN ONE ARE IN MICROFARADS.
3. INDUCTANCE VALUES GREATER THAN ONE ARE IN MICROHENRIES, LESS THAN ONE ARE IN MILLIHENRIES.
4.  CLOSE OF ARROW INDICATES PERMANENT ADJUSTMENT
5.  INDICATES SCREENED/REWORK ADJUSTMENT

Circuit: Power Unit RA.366

**Fig. 9**

R.F. MODULE200 Series

Cct. Ref.	Description	Value	Tol %	Rat.	Mfr. Part No.
J201	2 - 3 MHz Input (UG 1463)				Micon 1005/196
J202	2nd VFO Input (UG.1463)				Micon 1005/196
P201	1.6 MHz Output				Micon 1002/196
J204	Module Connector, 15 Contacts				Cannon DAMF-15-P

Capacitor

C201	Electrolytic	μF	-10+50	450	Sprague 39D206F450G14
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SWEPT R.F. STAGES300 SeriesResistors

		ohms		volts	
R1	Fixed Composition	10	5	1/4	RC07GF100J
R2	Fixed Composition	330	5	1/4	RC07GF331J
R3	Fixed Composition	330	5	1/4	RC07GF331J
R4	Fixed Composition	6.8k	5	1/4	RC07GF682J
R5	Fixed Composition	3.9k	5	1/4	RC07GF392J
R6	Fixed Composition	12k	5	1/4	RC07GF123J
R7	Fixed Composition	10k	5	1/4	RC07GF103J
R8	Fixed Composition	3.9k	5	1/4	RC07GF392J
R9	Fixed Composition	1k	5	1/4	RC07GF102J
R10	Fixed Composition	68	5	1/4	RC07GF680J
R11	Fixed Composition	1k	5	1/4	RC07GF102J
R12	Fixed Composition	1.8k	5	1/4	RC07GF182J
R13	Fixed Composition	4.7k	5	1/4	RC07GF472J
R14	Fixed Composition	1.5k	5	1/4	RC07GF152J
R15	Fixed Composition	220	5	1/4	RC07GF221J
R16	Fixed Composition	150k	5	1/4	RC07GF154J
R17	Fixed Composition	100k	5	1/4	RC07GF104J
R18	Fixed Composition	470	5	1/4	RC07GF471J
R19	Fixed Composition	330	5	1/4	RC07GF331J
R20	Fixed Composition	2.2k	5	1/4	RC07GF222J
R21	Fixed Composition	330	5	1/4	RC07GF331J
R22	Fixed Composition	39	5	1/4	RC07GF390J
R23	Fixed Composition	10k	5	1/4	RC07GF103J
R24	Fixed Composition	3.9k	5	1/4	RC07GF392J
R25	Fixed Composition	47	5	1/4	RC07GF470J

SWEPT R.F. STAGES - 300 Series contd.

Cct. Ref.	Description	Value	Tol %	Rat.	Mfr. Part No.
<u>Resistors (contd)</u>		ohms		watts	
R26	Fixed Composition	3.3k	5	1/4	RC07GF332J
R27	Fixed Composition	330	5	1/4	RC07GF331J
R28	Fixed Composition	18k	5	1/4	RC07GF183J
R29	Fixed Composition	3.3k	5	1/4	RC07GF332J
R30	Fixed Composition	330	5	1/4	RC07GF331J
R31	Fixed Composition	10k	5	1/4	RC07GF103J
R32	Fixed Composition	3.9k	5	1/4	RC07GF392J
R33	Fixed Composition	1k	5	1/4	RC07GF102J
R34	Fixed Composition	10k	5	1/4	RC07GF103J
R35	Fixed Composition	47	5	1/4	RC07GF470J
R36	Fixed Composition	3.3k	5	1/4	RC07GF332J
R37	Fixed Composition	680	5	1/4	RC07GF681J
R38	Fixed Composition	470	5	1/4	RC07GF471J
<u>Capacitors</u>				volts	
C1	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C2	Mica	82pF	1	300	CD6F82G300
C3	Electrolytic	25μF	25	25	Sprague TE-1207
C4	Mica	82pF	1	300	CD6F82G300
C5	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C6	Not used				
C7	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C8	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C9	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C10	Mica	470pF	5	100	CD7F471G100
C11	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C12	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C13	Ceramic disc	.001μF	10	500	Centralab CE-102
C14	Mica	220pF	2	300	CD7F221G300
C15	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C16	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C17	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C18	Mica	10pF	1	500	CD6C100J500
C19	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C20	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C21	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C22	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C23	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C24	Variable	7-35pF			RCI 28021
C25	Mica	68pF	1	500	CD6C68OG500

SWEPT R.F. STAGES - 300 Series contd.

Cct. Ref.	Description	Value	Tol %	Rat.	Mfr. Part No.
<u>Capacitors (contd)</u>				volts	
C26	Ceramic disc	.1 $\mu$ F	20	25	Sprague Monolythic 5C7
C27	Ceramic disc	.1 $\mu$ F	20	25	Sprague Monolythic 5C7
C28	Mica	82pF	1	300	CD6F82G300
C29	Mica	680pF	2	100	CD7F681G100
C30	Ceramic disc	.1 $\mu$ F	20	25	Sprague Monolythic 5C7
C31	Variable	7-35pF			RCI 28021
C32	Ceramic disc	.1 $\mu$ F	20	25	Sprague Monolythic 5C7
C33	Ceramic disc	.1 $\mu$ F	20	25	Sprague Monolythic 5C7
C34	Ceramic disc	.1 $\mu$ F	20	25	Sprague Monolythic 5C7
C35	Ceramic disc	.1 $\mu$ F	20	25	Sprague Monolythic 5C7
C36	Mica	100pF	1	300	CD6F101G300
C37	Mica	680pF	2	100	CD7F681G100
C38	Mica	68pF	1	500	CD6C680G500
C39	Ceramic disc	.1 $\mu$ F	20	25	Sprague Monolythic 5C7
<u>Inductors</u>					
L1	RF Choke	33 $\mu$ H			Nytronics Deciductor
L2	RF Choke Assy.				RCI D-02359
L3	RF Choke	10 $\mu$ H			Nytronics Deciductor
L4	RF Choke Assy.				RCI D-02360
<u>Filter Assemblies</u>					
A1	2 - 3 MHz Filter				RCI D-02363
A2	2 - 3 MHz Filter				RCI D-02364
A3	2 - 3 MHz Filter				RCI D-02365
A4	2 - 3 MHz Filter				RCI D-02366
A5	2 - 3 MHz Filter				RCI D-02367
A6	2 - 3 MHz Filter				RCI D-02368
A7	2 - 3 MHz Filter				RCI D-02369
A8	2nd Mixer Filter Assembly				RCI D-02370
<u>Diode</u>					
VR1	1N964B, Zener Diode				RCI 33520

# SWEPT R.F. STAGES - 300 Series contd

Cct. Ref.	Description	Value	Tol %	Rat.	Mfr. Part No.
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## Transistors

Q1	2N3283, Germanium PNP				RCI 30500
Q2	ST8230, Silicon PNP				Transitron RCI 31501
Q3	ST8230, Silicon PNP				Transitron RCI 31501
Q4	2N2996, Germanium PNP				T.I. RCI 30252
Q5	2N2996, Germanium PNP				T.I. RCI 30252
Q6	2N2996, Germanium PNP				T.I. RCI 30252

## Miscellaneous

CR1	Varicap V-33 33pF				Pacific Semiconductor
Y1	Crystal 19.4 MHz				CR67/U RCI 37001
T1	RF Transformer				RCI D-02361
T2	RF Transformer				RCI D-02361

## MARKER

### 400 Series

## Resistors

		ohms		watts	
R1	Fixed Composition	330	5	1/4	RC07GF331J
R2	Fixed Composition	100	5	1/4	RC07GF101J
R3	Fixed Composition	39k	5	1/4	RC07GF393J
R4	Fixed Composition	10k	5	1/4	RC07GF103J
R5	Fixed Composition	10k	5	1/4	RC07GF103J
R6	Fixed Composition	10k	5	1/4	RC07GF103J
R7	Fixed Composition	180k	5	1/4	RC07GF184J
R8	Fixed Composition	10k	5	1/4	RC07GF103J
R9	Fixed Composition	47k	5	1/4	RC07GF473J
R10	Fixed Composition	3.9k	5	1/4	RC07GF392J
R11	Fixed Composition	270	5	1/4	RC07GF271J
R12	Not used				
R13	Fixed Composition	3.9k	5	1/4	RC07GF392J
R14	Fixed Composition	3.9k	5	1/4	RC07GF392J
R15	Fixed Composition	82k	5	1/4	RC07GF823J
R16	Fixed Composition	330	5	1/4	RC07GF331J
R17	Fixed Composition	10k	5	1/4	RC07GF103J
R18	Fixed Composition	10k	5	1/4	RC07GF103J
R19	Fixed Composition	47	5	1/4	RC07GF470J
R20	Fixed Composition	820	5	1/4	RC07GF821J

MARKER - 400 Series contd.

Cct. Ref.	Description	Value	Tol %	Rat.	Mfr. Part No.
<u>Resistors (contd)</u>		ohms		watts	
R21	Fixed Composition	68	5	1/4	RC07GF680J
R22	Fixed Composition	3.3k	5	1/4	RC07GF332J
R23	Fixed Composition	1k	5	1/4	RC07GF102J
R24	Fixed Composition	560	5	1/4	
R25	Fixed Composition	3.9k	5	1/4	RC07GF392J
R26	Fixed Composition	68	5	1/4	RC07GF680J
R27	Fixed Composition	82k	5	1/4	RC07GF823J
R28	Fixed Composition	3.9k	5	1/4	RC07GF392J
R29	Fixed Composition	330	5	1/4	RC07GF331J
R30	Fixed Composition	1.5k	5	1/4	RC07GF152J
R31	Fixed Composition	10k	5	1/4	RC07GF103J
R32	Fixed Composition	820	5	1/4	RC07GF821J
R33	Fixed Composition	10k	5	1/4	RC07GF103J
R34	Fixed Composition	330	5	1/4	RC07GF331J
R35	Fixed Composition	10k	5	1/4	RC07GF103J
R36	Fixed Composition	5.6k	5	1/4	RC07GF562J
R37	Fixed Composition	10k	5	1/4	RC07GF103J
R38	Fixed Composition	39k	5	1/4	RC07GF393J
R39	Fixed Composition	10k	5	1/4	RC07GF103J
R40	Fixed Composition	120k	5	1/4	RC07GF124J
R41	Fixed Composition	10k	5	1/4	RC07GF103J
R42	Fixed Composition	330	5	1/4	RC07GF331J
R43	Fixed Composition	10k	5	1/4	RC07GF103J
R44	Fixed Composition	39k	5	1/4	RC07GF393J
R45	Fixed Composition	10k	5	1/4	RC07GF103J
R46	Fixed Composition	10k	5	1/4	RC07GF103J
R47	Fixed Composition	56k	5	1/4	RC07GF563J
R48	Fixed Composition	10k	5	1/4	RC07GF103J
R49	Fixed Composition	10	5	1/4	RC07GF100J
R50	Fixed Composition	10	5	1/4	RC07GF100J
<u>Capacitors</u>				volts	
C1	Mica	220pF	2	300	CD7F221G300
C2	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C3	Mica	390pF	2	100	CD7F391G100
C4	Tantalum	2.2μF	10	20	Kemet K2R2J20KS
C5	Mica	220pF	2	300	CD7F221G300

# MARKER - 400 Series contd.

Cct. Ref.	Description	Value	Tol %	Rat.	Mfr. Part No.
<u>Capacitors (contd)</u>				volts	
C6	Tantalum	2.2μF	10	20	Kemet K2R2J20KS
C7	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C8	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C9	Tantalum	10μF	10	20	Sprague 150D106X9020B2
C10	Mica	100pF	1	300	CD6F101G300
C11		.22μF			
C12	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C13	Tantalum	2.2μF	10	20	Kemet K2R2J20KS
C14	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C15	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C16	Mica	100pF	1	300	CD6F101G300
C17	Mica	680pF	2	100	CD7F681G100
C18	Tantalum	2.2μF	10	20	Kemet K2R2J20KS
C19	Electrolytic	25μF	-20+100	25	Sprague TE-1207
C20	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C21	Tantalum	2.2μF	10	20	Kemet K2R2J20KS
C22	Tantalum	10μF	10	20	Sprague 150D106X9020B2
C23	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C24	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C25	Tantalum	2.2μF	10	20	Kemet K2R2J20KS
C26	Tantalum	3.3μF	10	35	Kemet K3R3J35KS
C27	Tantalum	2.2μF	10	20	Kemet K2R2J20KS
C28	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C29	Electrolytic	25μF	-20+100	25	Sprague TE-1207
C30	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C31	Electrolytic	25μF	-20+100	25	Sprague TE-1207
C32	Tantalum	2.2μF	10	20	Kemet K2R2J20KS
C33	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C34	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7

## Filter Assemblies

A1	Filter Assembly	RCI D-02376
A2	Filter Assembly	RCI D-02377

## Transformers

T1	RF Transformer (19.4 MHz)	RCI D-02378
T2	RF Transformer (19.4 MHz)	RCI D-02378



MARKER - 400 Series contd.

Cct. Ref.	Description	Value	Tol %	Rat.	Mfr. Part No.
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Transistors

Q1	2N956, NPN -Silicon				RCI 32253
Q2	2N956, NPN -Silicon				RCI 32253
Q3	2N3323, PNP -Germanium				RCI 30251
Q4	2N2996, PNP -Germanium				RCI 30252
Q5	2N3323, PNP -Germanium				RCI 30251
Q6	2N2996, PNP -Germanium				RCI 30252
Q7	2N2996, PNP -Germanium				RCI 30252
Q8	2N3323, PNP -Germanium				RCI 30251
Q9	2N956, NPN -Silicon				RCI 32253
Q10	2N956, NPN -Silicon				RCI 32253
Q11	2N956, NPN -Silicon				RCI 32253
Q12	2N956, NPN -Silicon				RCI 32253

Diodes

CR1	1N626				RCI 35507
CR2	1N626				RCI 35507
CR3	1N626				RCI 35507
CR4	1N914				RCI 35510

I.F. MODULE

500 Series

Connectors

J501	1.6 MHz IF input				Micon 1003
J502	1.6 MHz IF input				Micon 1003
J503	IF Gain				Micon 1003
J504	IF Gain				Micon 1003
J505	Module Connector, 15 Contacts				Cannon DAMF-15-P

Capacitor

C501	Electrolytic	500μF	-10+75	50	Sprague 39D507G050GLA
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# I.F. AND DETECTOR

## 600 Series

Cct. Ref.	Description	Value	Tol %	Rat.	Mfr. Part No.
<u>Resistors</u>		ohms		watts	
R1	Not used				
R2	Fixed Composition	100	5	1/4	RC07GF101J
R3	Fixed Composition	100	5	1/4	RC07GF101J
R4	Fixed Composition	10	5	1/4	RC07GF100J
R5	Fixed Composition	220	5	1/4	RC07GF221J
R6	Fixed Composition	12k	5	1/4	RC07GF123J
R7	Fixed Composition	3.9k	5	1/4	RC07GF392J
R8	Fixed Composition	1k	5	1/4	RC07GF102J
R9	Fixed Composition	1k	5	1/4	RC07GF102J
R10	Fixed Composition	750	5	1/4	RC07GF751J
R11	Fixed Composition	270	5	1/4	RC07GF271J
R12	Fixed Composition	220	5	1/4	RC07GF221J
R13	Fixed Composition	27k	5	1/4	RC07GF273J
R14	Fixed Composition	1.8k	5	1/4	RC07GF182J
R15	Fixed Composition	18k	5	1/4	RC07GF183J
R16	Fixed Composition	47	5	1/4	RC07GF470J
R17	Fixed Composition	1k	5	1/4	RC07GF102J
R18	Fixed Composition	10	5	1/4	RC07GF100J
R19	Fixed Composition	220	5	1/4	RC07GF221J
R20	Fixed Composition	12k	5	1/4	RC07GF123J
R21	Fixed Composition	3.9k	5	1/4	RC07GF392J
R22	Potentiometer	100	30	1/2	Beckman 62P-R100
R23	Fixed Composition	1k	5	1/4	RC07GF102J
R24	Fixed Composition	1.2k	5	1/4	RC07GF122J
R25	Fixed Composition	820	5	1/4	RC07GF821J
R26	Fixed Composition	180	5	1/4	RC07GF181J
R27	Fixed Composition	1k	5	1/4	RC07GF102J
R28	Fixed Composition	47	5	1/4	RC07GF470J
R29	Fixed Composition	220	5	1/4	RC07GF221J
R30	Fixed Composition	330	5	1/4	RC07GF331J
R31	Fixed Composition	12k	5	1/4	RC07GF123J
R32	Fixed Composition	3.9k	5	1/4	RC07GF392J
R33	Fixed Composition	1k	5	1/4	RC07GF102J
R34	Fixed Composition	220	5	1/4	RC07GF221J
R35	Potentiometer	100k	30	1/2	Beckman

# I.F. AND DETECTOR - 600 Series contd.

Cct. Ref.	Description	Value	Tol %	Rat.	Mfr. Part No.
<u>Resistors (contd.)</u>		ohms		watts	
R36	Fixed Composition	10k	5	1/4	RCO7GF103J
R37	Fixed Composition	47k	5	1/4	RCO7GF473J
R38	Fixed Composition	3.9k	5	1/4	RCO7GF392J
R39	Potentiometer	20k	30	1/2	Beckman 62P-R20K
R40	Fixed Composition	1.5k	5	1/4	RCO7GF152J
R41	Fixed Composition	100	5	1/4	RCO7GF101J
R42	Fixed Composition	68	5	1/4	RCO7GF680J
R43	Fixed Composition	4.7k	5	1/4	RCO7GF472J
<u>Capacitors</u>				volts	
C1	Electrolytic	25 $\mu$ F	-20+100	25	Sprague TE-1207
C2	Ceramic disc	.1 $\mu$ F	20	25	Sprague Monolythic 5C7
C3	Ceramic disc	.1 $\mu$ F	20	25	Sprague Monolythic 5C7
C4	Ceramic disc	.1 $\mu$ F	20	25	Sprague Monolythic 5C7
C5	Ceramic disc	.1 $\mu$ F	20	25	Sprague Monolythic 5C7
C6	Mica	3600pF	5	500	CMO6F362JN3
C7	Ceramic disc	.1 $\mu$ F	20	25	Sprague Monolythic 5C7
C8	Mica	3600pF	5	500	CMO6F362JN3
C9	Ceramic disc	.1 $\mu$ F	20	25	Sprague Monolythic 5C7
C10	Ceramic disc	.1 $\mu$ F	20	25	Sprague Monolythic 5C7
C11	Mica	330pF	2	100	CD7F331G100
C12	Ceramic disc	.1 $\mu$ F	20	25	Sprague Monolythic 5C7
C13	Ceramic disc	.1 $\mu$ F	20	25	Sprague Monolythic 5C7
C14	Ceramic disc	.1 $\mu$ F	20	25	Sprague Monolythic 5C7
C15	Ceramic disc	.1 $\mu$ F	20	25	Sprague Monolythic 5C7
C16	Mica	270pF	2	300	CD7F271G300
C17	Ceramic disc	.1 $\mu$ F	20	25	Sprague Monolythic 5C7
C18	Ceramic disc	.1 $\mu$ F	20	25	Sprague Monolythic 5C7
C19	Ceramic disc	.1 $\mu$ F	20	25	Sprague Monolythic 5C7
C20	Mica	680	2	100	CD7F681G100
C21	Ceramic disc	.1 $\mu$ F	20	25	Sprague Monolythic 5C7
C22	Ceramic disc	.1 $\mu$ F	20	25	Sprague Monolythic 5C7
C23	Mica	330pF	2	100	CD7F331G100
C24	Ceramic disc	.005 $\mu$ F	20	500	Centralab, DM502
C25	Ceramic disc	.1 $\mu$ F	20	25	Sprague Monolythic 5C7
C26	Mica	330pF	2	100	CD7F331G100
C27	Ceramic disc	.005 $\mu$ F +80-20	50		Sprague TG-D50
C28	Ceramic disc	.005 $\mu$ F +80-20	50		Sprague TG-D50
C29	Ceramic disc	.1 $\mu$ F	20	25	Sprague Monolythic 5C7

I.F. AND DETECTOR - 600 Series contd.

Cct. Ref.	Description	Value	Tol. %	Rat.	Mfr	Part No.
<u>Inductors</u>						
L1	Variable, Coil Assy.				RCI	D-02382
L2	Variable, Coil Assy.				RCI	D-02382
L3	Variable, Coil Assy.				RCI	D-02379
<u>Filter Assemblies</u>						
A1	Filter Assembly 1.6 MHz				RCI	D-02380
A2	Filter Assembly				RCI	D-02381
<u>Transformers</u>						
T1	455 kHz i.f.				RCI	B-3019-1
T2	455 kHz i.f.				RCI	B-3019-2
T3	455 kHz i.f.				RCI	B-3019-2
<u>Diodes</u>						
CR1	1N695, Germanium				RCI	35515
CR2	Same as CR1					
<u>Transistors</u>						
Q1	2N1632, PNP Germanium				RCI	30752
Q2	2N1632, PNP Germanium				RCI	30752
Q3	2N1638, PNP Germanium				RCI	30755
Q4	2N1638, PNP Germanium				RCI	30755
Q5	2N3439, NPN Silicon				RCI	32001
<u>Relays</u>						
K1	dpdt, non-latching, 26.5 volts				GE3SBC1008A2	
K2	dpdt, non-latching, 26.5 volts				GE3SBC1008A2	
<u>Crystal Filter</u>						
FL1	Bandpass Crystal Filter, 455 kHz				RCI	C-02073

# I.F. SWEEP

## 700 Series

Cct. Ref.	Description	Value	Tol %	Rat.	Mfr. Part No.
<u>Resistors</u>		ohms		watts	
R1	Fixed Composition	47	5	1/4	RC07GF470J
R2	Fixed Composition	330	5	1/4	RC07GF331J
R3	Fixed Composition	330	5	1/4	RC07GF331J
R4	Fixed Composition	47k	5	1/4	RC07GF473J
R5	Potentiometer	50k	30	1/2	Beckman 62P-R50K
R6	Potentiometer	50k	30	1/2	Beckman 62P-R50K
R7	Fixed Composition	2.2k	5	1/4	RC07GF222J
R8	Fixed Composition	1k	5	1/4	RC07GF102J
R9	Fixed Composition	33k	5	1/4	RC07GF333J
R10	Potentiometer	10k	30	1/2	Beckman 62P-R10K
R11	Potentiometer	20k	30	1/2	Beckman 62P-R20K
R12	Not used				
R13	Fixed Composition	270	5	1/4	RC07GF271J
R14	Fixed Composition	10k	5	1/4	RC07GF103J
R15	Fixed Composition	12k	5	1/4	RC07GF123J
R16	Fixed Composition	3.9k	5	1/4	RC07GF392J
R17	Fixed Composition	2.2k	5	1/4	RC07GF222J
R18	Fixed Composition	4.7k	5	1/4	RC07GF472J
R19	Fixed Composition	2.2k	5	1/4	RC07GF222J
R20	Fixed Composition	150k	5	1/4	RC07GF154J
R21	Fixed Composition	100k	5	1/4	RC07GF104J
R22	Fixed Composition	2.2k	5	1/4	RC07GF222J
R23	Fixed Composition	3.9k	5	1/4	RC07GF392J
R24	Fixed Composition	470	5	1/4	RC07GF471J
<u>Capacitors</u>				volts	
C1	Not used				
C2	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C3	Electrolytic	4.7μF	10	35	Sprague 150D475X9035B2
C4	Electrolytic	22μF	10	15	Sprague 150D226X9015B2
C5	Ceramic disc	.005μF	+80-20	50	Sprague TG-D50
C6	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C7	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C8	Not used				
C9	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C10	Ceramic disc	.005μF	+80-20	50	Sprague TG-D50

I.F. SWEEP 700 Series contd.

Cct. Ref.	Description	Value	Tol %	Rat.	Mfr. Part No.
Capacitors (contd.)				volts	
C11	Ceramic disc	1800pF	10	1000	Centralab DD182
C12	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C13	Ceramic disc	.005μF	+80-20	50	Sprague TG-D50

Transistors

Q1	2N492, Silicon PNP - TI	RCI 31252
Q2	2N1308, Germanium, NPN	RCI 30753
Q3	2N1632, Germanium, PNP	RCI 30752
Q4	2N3242, Silicon, NPN	RCI 31251

Miscellaneous.

VR1	Diode, 1N963B, Silicon	RCI 35519
CR1	Varicap, 150pF	Philco V-4091
K1	Relay, dpdt, non-latching, 26.5 volts	G.E. 35BC1008A2
A1	Coil Assembly	RCI D-02388
Y1	Crystal, 1145 kHz, CR19A/U	RCI 37002

HORIZONTAL AND RF TIME BASES

800 Series

Resistors

		ohms		watts	
R1	Fixed Composition	18	5	1/4	RC07GF180J
R2	Fixed Composition	5.6k	5	1/4	RC07GF562J
R3	Fixed Composition	2.7k	5	1/4	RC07GF272J
R4	Fixed Composition	470	5	1/4	RC07GF471J
R5	Fixed Composition	330	5	1/4	RC07GF331J
R6	Fixed Composition	47k	5	1/4	RC07GF473J
R7	Potentiometer	50k	30	1/2	Beckman 62P-R50K
R8	Potentiometer	10k	30	1/2	Beckman 62P-R10K
R9	Fixed Composition	390k	5	1/4	RC07GF394J
R10	Fixed Composition	2.2k	5	1/4	RC07GF222J
R11	Fixed Composition	1k	5	1/4	RC07GF102J
R12	Potentiometer	10k	30	1/2	Beckman 62P-R10K
R13	Potentiometer	2k	30	1/2	Beckman 62P-R2K
R14	Fixed Composition	3.9k	5	1/4	RC07GF392J
R15	Potentiometer	2k	30	1/2	Beckman 62P-R2K

# HORIZONTAL AND RF TIME BASES 800 Series contd.

Cct. Ref.	Description	Value	Tol %	Rat.	Mfr. Part No.
<u>Resistors (contd)</u>					
		ohms		watts	
R16	Fixed Composition	560	5	1/4	RC07GF561J
R17	Fixed Composition	5.6k	5	1/4	RC07GF562J
R18	Fixed Composition	2.7k	5	1/4	RC07GF272J
R19	Fixed Composition	470	5	1/4	RC07GF471J
R20	Fixed Composition	330	5	1/4	RC07GF331J
R21	Fixed Composition	100	5	1/4	RC07GF101J
R22	Fixed Composition	47k	5	1/4	RC07GF473J
R23	Potentiometer	50k	30	1/2	Beckman 62P-R50K
R24	Potentiometer	50k	30	1/2	Beckman 62P-R50K
R25	Fixed Composition	2.2k	5	1/4	RC07GF222J
R26	Fixed Composition	1k	5	1/4	RC07GF102J
R27	Fixed Composition	1k	5	1/4	RC07GF102J
R28	Fixed Composition	8.2k	5	1/4	RC07GF822J
R29	Potentiometer	5k	30	1/2	Beckman 62P-R5K
<u>Capacitors</u>					
				volts	
C1	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C2	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C3	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C4	not used				
C5	Electrolytic	4.7μF	10	35	Sprague 150D475X9035B2
C6	Electrolytic	22μF	10	15	Sprague 150D226X9015B2
C7	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C8	Not used				
C9	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C10	Ceramic disc	.1μF	20	25	Sprague Monolythic 5C7
C11	Electrolytic	4.7μF	10	35	Sprague 150D475X9035B2
C12	Electrolytic	22μF	10	15	Sprague 150D226X9015B2
<u>Transistors</u>					
Q1	2N1632, PNP - Germanium				RCI 30752
Q2	2N492, PNP - Silicon, TI				RCI 31252
Q3	2N1308, NPN - Germanium				RCI 30753
Q4	2N3439, NPN - Silicon				RCI 32001
Q5	2N1632, PNP - Germanium				RCI 30752
Q6	2N492, PNP - Silicon, TI				RCI 31252
Q7	2N1308, NPN - Germanium				RCI 30753
<u>Diode</u>					
CR1	1N755A, 7.5 V ref, ±5%, 400 mW				Motorola

POWER UNIT

900 Series

Cct. Ref.	Description	Value	Tol %	Rat.	Mfr. Part No.
<u>Resistors</u>		ohms		watts	
R1	Fixed Composition	2k	5	1/4	RC07GF202J
R2	Potentiometer	20k	30	1/2	Beckman 62P-R20K
R3	Fixed Composition	39k	5	1/2	RC07GF393J
R4	Fixed Composition	1.5M	5	1/4	RC07GF155J
R5	Fixed Composition	220k	5	1/4	RC07GF224J
R6	Fixed Composition	2.2M	5	1/4	RC07GF225J
R7	Fixed Composition	1M	5	1/4	RC07GF105J
R8	Fixed Composition	1M	5	1/4	RC07GF105J
R9	Fixed Composition	1M	5	1/4	RC07GF105J

Transistor

Q1	2N1189, Germanium, PNP	RCI 30750
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Diodes

VR1	1N967B, Zener diode	RCI 33518
VR2	1N3049B, Zener diode	RCI 33516
VR3	1N4761A, Zener diode	RCI 33517
VR4	1N4761A, Zener diode	RCI 33517



## APPENDIX

### POWER SUPPLY UNIT PU. 1153

1. The PU. 1153 is the power unit used in the RA. 366B. The unit consists of a main assembly and a printed circuit board containing the stabilizer circuit. The circuit is shown in Fig. A. 1 at the end of this appendix.

#### Inputs and Outputs

2. The PU. 1153 can operate from the following supplies.

- (a) 100-125 volts a. c. 45-400 Hz single phase.
- (b) 200-250 volts a. c. 45-400 Hz single phase.
- (c) 21-27 volts d. c. with positive earth.

Two outputs are provided by the unit:

- (a) -16 volts (regulated) 400 mA.
- (b) -20 volts (unregulated) 200 mA. Generally this level will be approximately -24 volts.

#### Switches

3. A. C. /D. C. Switch. A locking plate displays the type of power input, either 'A. C.' or 'D. C.'. If the indication is not correct, remove the locking plate (one screw), set the switch to the alternative position and replace the locking plate in the reversed position so that the correct indication is displayed.
4. Voltage Selector Switch. This switch is in use when the A. C. /D. C. switch is set to A. C. It should display the correct a. c. supply voltage range, either 100-125 or 200-250. If the setting is not correct remove the locking plate, reset the switch and replace the locking plate in the reversed position so that the correct voltage range is indicated.

#### Fuselinks

5. Two fuselinks are provided. The MAINS fuse is in circuit whenever the A. C. /D. C. switch is set to A. C. The H. T. fuse is in circuit on both supplies. Replacement fuses must be of the anti-surge type. The MAINS fuse is rated at 500 mA when operating on 100-125 volts a. c.

## Power Connections

6. The external power supply is connected via a 3-core power cable to which a suitable 3-pin connector should be fitted. For an a.c. supply connect the red lead to line, black to neutral and green to earth (ground). For a d.c. supply connect the red lead to positive and the black lead to negative.

## Circuit Description

7. When operating on a.c. the input supply is applied to the primary winding of transformer 1T1 via the switch 1SA which connects the windings in parallel for 100-125 volts or in series for 200-250 volts. In d.c. operating the positive input is connected to the 0 volt output (earth) and the negative input to the regulator transistor and the unregulated -20 volt output.
8. The fuse 1FS1 protects the input to the transformer, the other fuse 1FS2 is common to both a.c. and d.c. inputs to the bridge rectifiers D1 and D2. The rectified output from D1 is fed to the stabilizer board and the output from D2 provides the unregulated -20 volt supply. The capacitors 1C1 and 1C2 serve as an r.f. filter and the resistor 1R1 is provided to discharge the capacitors when the power is switched off.
9. The output from the bridge rectifier D1 is fed to the filter capacitor 1C3. The transistor 1VT1 completes the connection to the -16 volt output line and stabilizes the output by acting as a series regulator under the control of the d.c. amplifiers VT1 and VT2. The output can be set to -16 volts by adjustment of the potentiometer 1RV1.
10. The emitter of VT2 is held at a constant voltage by the zener diode D3. The level at the base of VT2 is determined by the setting of 1RV1 and also by an change of voltage occurring in the chain R4, 1RV1 and R5 due to a change in the output load. For example, if an increase in output loading causes the voltage at 1RV1 to go less negative the collector current in VT2 decreases. This causes a change in the base current of the beta multiplier VT1 which in turn increases the output of 1VT1 so as to maintain a constant output voltage.
11. To allow the stabilizer to operate from a wide range of input voltages the network R1, R2 and R3 together with the zener diode D4 provide input regulation. The diode D4 holds the junction of R1 and R2 at a constant 4.7 volts, thus clamping the base of VT1 at a constant level despite changes in input voltage. The electrolytic capacitor C1 eliminates ripple.

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
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### COMPONENTS LIST PU.1153

#### Component Board Assembly BA.37549

##### Resistors

1R1	100k	Metal Oxide		5	907866	Electrosil TR5
R1	1k	Metal Oxide		5	906031	Electrosil TR5
R2	1.8k	Metal Oxide		5	906026	Electrosil TR5
R3	2.2k	Metal Oxide		5	906020	Electrosil TR5
R4	2.7k	Metal Oxide		5	906347	Electrosil TR5
R5	2.7k	Metal Oxide		5	906347	Electrosil TR5
R6	1.2k	Metal Oxide		5	906346	Electrosil TR5

##### Potentiometers

1RV1	1.5k				908689	Colven 1106/9S
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##### Capacitors

1C1	.02	Paper	350	20	902279	Dubilier Minicap G1
1C2	.02	Paper	350	20	902279	Dubilier Minicap G1
1C3	500	Electrolytic	64	-10 +50	906759	Mullard C431 BR/H500
1C4	500	Electrolytic	64	-10 +50	906759	Mullard C431 BR/H500
1C5	100	Electrolytic	50		900506	Hunts MEFC43AT
C1	100	Electrolytic	6.4	-10 +50	911691	Mullard C426 AR/C100
C2	0.1	Polyester	250	20	909428	Mullard C280 AE/P100K

##### Transformer

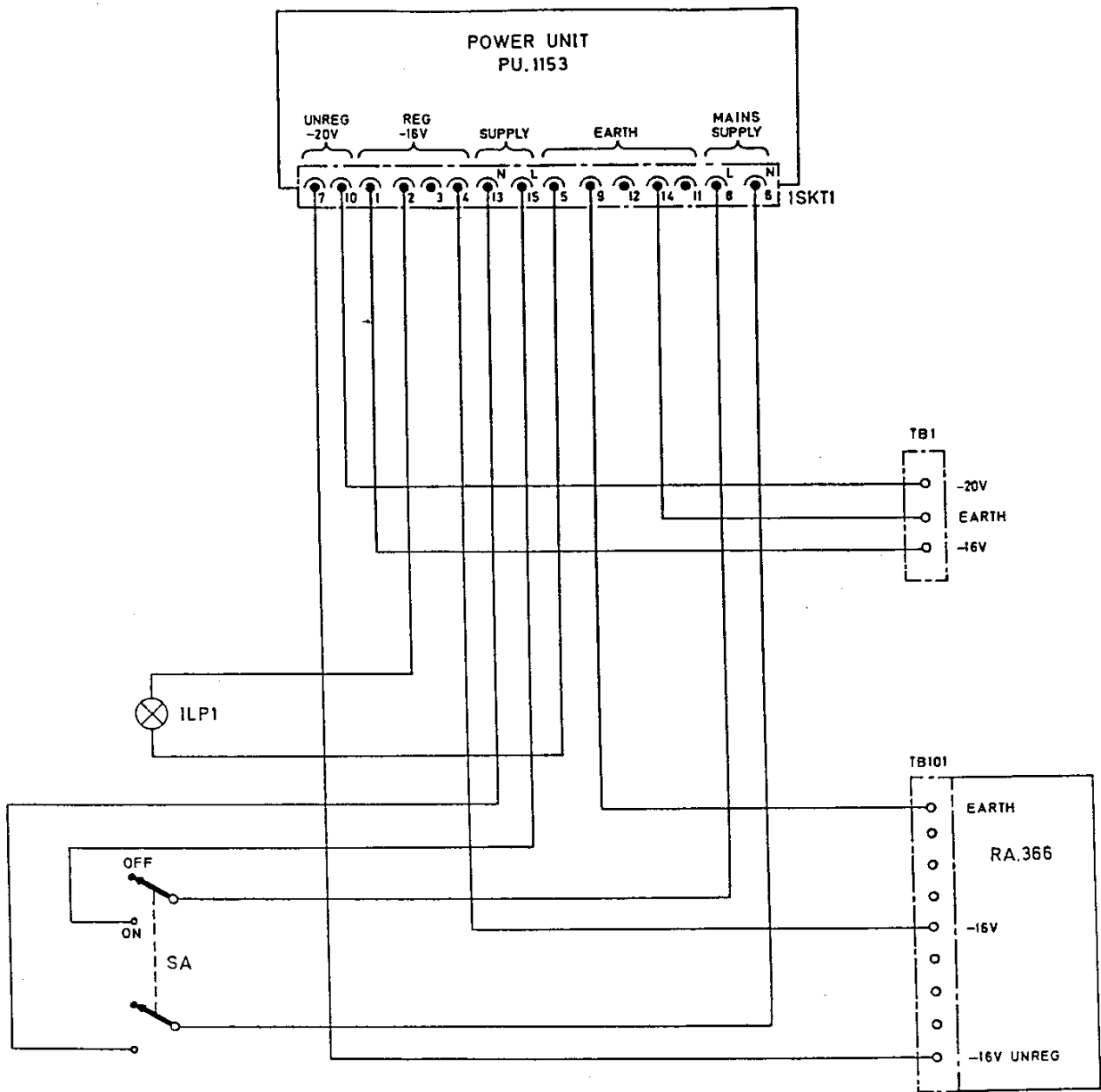
1T1		Mains power transformer				USA D-01650
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##### Transistors

1VT1		High Current n. p. n.			906371	RCA 2N 3055
VT1		p. n. p.			911565	Mullard BCY40
VT2		p. n. p.			911565	Mullard BCY40

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part No.	Manufacturer
<u>Diodes</u>						
1D1		18V Zener			911123	Mullard OAZ 234
D1		Rectifier Unit			909020	Motorola MDA 920/3
D2		Rectifier Unit			909020	Motorola MDA 920/3
D3		6.8V Zener			908348	Hughes HS2068
				or	914064	Mullard BZY 88C6 V8
D4		4.7V Zener			909717	Mullard OAZ 240
<u>Fuselinks</u>						
1FS1		Mains 250mA anti-surge (200-250V working)			911700	Beswick TDC 134
		Mains 500mA anti-surge (100-125V working)			911834	Beswick TDC 134
1FS2		H. T. 1A anti-surge			912052	Beswick TDC 134
		Fuseholders			900412	Belling Lee L575
<u>Switches</u>						
1SA		Slider Panel			912063	E. M. I. Type S5
1SB		Slider Panel			912063	E. M. I. Type S5
<u>Connectors</u>						
1SKT1		Socket: sub miniature 15 way			908683	Cannon DAMF 15S
PL1		Plug: fixed 3 pin brass			900011	Plessey Mk4 CZ 63953/5
		Free socket for power connection to PL1			905151	Plessey Mk4 2CZ 83283/5
		Outlet Accessory Set for free socket			905154	Plessey 508/1/ 03008/205





BC 40880/B	H309/10
1	

Power Unit Connections To RA.366B

Fig. 10

### ORDERS FOR SPARE PARTS

In order to expedite handling of spare part orders,  
please quote:-

- (1) Type and serial number of equipment.
- (2) Circuit reference, description, Racal part number, and manufacturer of part required.
- (3) Quantity required.

NOTE: If the equipment is designed on a modular basis, please include the type and description of the module for which the replacement part is required.

## CHAPTER 7

### LIST OF COMPONENTS

#### ORDERS FOR SPARE PARTS

In order to expedite handling of orders for spare parts please supply the following information:-

- (1) Type and Serial No. of equipment.
- (2) Series No. shown on the circuit diagram.  
(The appropriate Series No. is also stated at the beginning of each section in the parts lists).
- (3) Circuit Reference No.
- (4) Manufacturer's Part No.
- (5) Description of part required and quantity.